Curriculum Vitae

Markus Berndt

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Research Interests and Expertise

Numerical solution of partial differential equations (finite element theory, adaptive mesh refinement techniques, local error estimation)

Linear solvers with emphasis on multilevel methods.

Scientific parallel computing.

Optimization algorithms for grid generation problems.

Degrees

Ph.D. Applied Mathematics (5/1999), Department of Applied Mathematics, University of Colorado at Boulder.

Thesis title: Adaptive refinement and the treatment of singularities in first-order system least squares (FOSLS). Advisor: Prof. Stephen F. McCormick.

M.S. Applied Mathematics (5/1996), Department of Applied Mathematics, University of Colorado at Boulder.

Diplom-Mathematiker (6/1994), Lehrstuhl für Angewandte Mathematik, Heinrich-Heine-Universität Düsseldorf, Germany

Diplom thesis title: Multi-Grid-Verfahren und Adaptive Verfeinerungen. Advisor: Prof. Kristian Witsch.

Experience

Limited Term Staff Member (12/2000 to present), Theoretical Division, T-7 Mathematical Modeling and Analysis Group, Los Alamos National Laboratory.

Develop production level iterative and multilevel solvers, and conduct research in the areas of multigrid methods, linear solvers, numerical partial differential equations, and optimization algorithms for grid generation problems.

Postdoctoral Research Associate (6/1999 to 12/2000), Theoretical Division, T-7 Mathematical Modeling and Analysis Group, Los Alamos National Laboratory.

Conduct research in the areas of multigrid methods, linear solvers, and numerical partial differential equations.

Graduate Research Assistant (academic years 1994/95 through 1998/99, except spring semester 1997), Department of Applied Mathematics, University of Colorado at Boulder, Advisor: Prof. Stephen F. McCormick.

Conducted Research in the field of multigrid methods and numerical partial differential equations with emphasis on first-order system least squares methods.

Teaching Assistant (spring semester 1997), Department of Applied Mathematics, University of Colorado at Boulder.

Taught Calculus III recitations, held review sessions and graded homework assignments and exams.

Graduate Research Assistant (summers of 1994, 1995, and 1996), CIC-3 (1994), and CIC-19 (1995 and 1996), Los Alamos National Laboratory, Advisor: Dr. Daniel J. Quinlan.

Developed and implemented an object oriented load balancing algorithm for structured grid applications.

Implemented an MPI interface for the parallel C++ array class library P++, one of the base classes of the Overture framework at LLNL.

Performed tests of stability and parallel performance of the parallel array class library P++.

Student Assistant (10/1992 to 6/1993), Lehrstuhl für Angewandte Mathematik, Heinrich-Heine-Universität Düssldorf, Advisor: Prof. Kristian Witsch.

Conducted research in the field of fast adaptive composite grid methods.

Publications

Multilevel Accelerated Optimization for Problems in Grid Generation, M. Berndt and M. Shashkov, Proceedings of the 12th International Meshing Roundtable, Santa Fe, NM, 2003.

Convergence of mimetic finite difference discretizations, M. Berndt, K. Lipnikov, D. Moulton, and M. Shashkov, East-West Journal of Numerical Mathematics, Vol. 9, No. 4, (2001), pp. 265-284.

Local error estimates and adaptive refinement for first-order system least squares (FOSLS), Markus Berndt, Thomas A. Manteuffel, and Stephen F. McCormick, E.T.N.A., vol. 6 (1997), pp. 35-43.

MLB: Multilevel load balancing for structured grid applications, Dan Quinlan and Markus Berndt, Proceedings of the SIAM Parallel Conference, Minneapolis, MN, March 1997.

Multigrid on overlapping patches, Markus Berndt and Kristian Witsch, in Seventh Copper Mountain Conference on Multigrid Methods, vol. CP 3339, NASA, Hampton, VA, 1996, pp. 31-40.

Conference Presentations

Parameter estimation via risk-based optimization, Los Alamos Computer Science Instituite Symposium, 2003.

Multilevel accelerated optimization for problems in grid generation, 7th US Congress on Computational Mechanics in Albuquerque, 2003.

Multilevel accelerated optimization for problems in grid generation. Copper Mountain Conference on Multigrid Methods, 2003.

Multilevel accelerated optimization for unstructured meshes, Los Alamos Computer Science Institiute Symposium, 2002.

Small Linux Cluster Workshop:Installing MPI and Running Parallel Code, At ASME International Mechanical Engineering Congress and Exposition, 2001.

Small Linux Cluster Workshop: Installing MPI and Running Parallel Code, SIAM Annual Conference, San Diego, 2001.

On a multilevel solver that utilizes singular basis functions for the solution of the diffusion equation with discontinuous coefficient. At 2000 Copper Mountain Conference on Iterative Methods, Copper Mountain, CO.

On a multilevel solver for the flux based first-order system least squares formulation of the diffusion equation with discontinuous coefficient, At 2000 Arizona Days, Center for Nonlinear Studies, Los Alamos National Laboratory, Los Alamos, NM.

Toward Multigrid for L2 FOSLS for the Diffusion Equation with Discontinuous Coefficients and Singular Basis Functions. At 1999 Copper Mountain Conference on Multigrid Methods, Copper Mountain, CO.

First-Order System Least Squares for Elliptic Problems with Discontinuous Coefficients. At 1998 Copper Mountain Conference on Iterative Methods, Copper Mountain, CO.

Adaptive Mesh Refinement for Fist-Order System Least Squares. At 1997 Copper Mountain Conference on Multigrid Methods, Copper Mountain, CO.

Multigrid on Overlapping Patches. At 1995 Copper Mountain Conference on Multigrid Methods, Copper Mountain, CO.

Activities

Co-organizer of Arizona Days, January 28-29, 2000, at the Center for Nonlinear Studies at Los Alamos National Laboratory.

Reviewer for SIAM Journal of Numerical Analysis and SIAM Journal of Scientific Computing, and E.T.N.A.

Professional Collaborations

with Stephen F. McCormick and Thomas A. Manteuffel, both at Department of Applied Mathematics, University of Colorado at Boulder (since 1999).

with Mary F. Wheeler, at University of Texas at Austin (since 2003).

with Ivan Yotov, at University of Pittsburgh (since 2003).

Memberships

Society for Industrial and Applied Mathematics (SIAM), member sine 1996.

United States Association for Computational Mechanics (USACM), member since 2001.

October, 2003